COPY— LETTER TO DR. R. SCOTT (P.E.) FROM

[redacted] STAT

July 12, 1956 Encl. #1 to

SAPC 7883
COPY 1 OF 1

Rod:

We have been conducting drift sight tests at the Ranch and have arrived at conclusions that make it imperative that we immediately go to work on your drift sight and patch it up to make it operational. The following program is the result.

DRIFT SIGHT OPERATIONAL PROGRAM

The purpose of this program is to outline the course of action which will make the drift sight an operational piece of equipment. At present, we are carrying 45 lbs. of gears and optics around in the airplane, which is no more useful and a lot less satisfactory for viewing the ground than a hole in the floor.

The prime trouble here appears to be that the pilots have very great difficulty in coordinating the drift and track knobs. This is further complicated by the fact that there are many shadows and lines in the drift sight presentation, which are aggravated by the intensely bright light at altitude.

The argument that this drift sight is not really a drift sight but just a viewer to be used with the C equipment is not really correct because it must be operable as a drift sight in order for the pilot to be able to make the correct drift and track knob settings, which in turn are used by the C computer. If the pilot is not able to set these knobs up correctly, such as is the case with the present equipment, then this equipment is useless with the C equipment.

We have run six flight tests to date for the purpose of gathering data for checking the drift sight operation. This data shows:

(1) That the drift knob is hardly ever set correctly in flight. In fact, on straight and level runs there will be several settings of the drift knob appearing for both left and right drift. This is corroborated by the observations of the training people and other pilots. Further, several times it appears that two runs made at 180 degrees to each other will both have left or both have right drift as much as 5 degrees.

(2) On one test made with the drift knob purposely held at zero, the tracking knob was apparently able to be set quite accurately. In fact, within about 3.2%.

(3) The tracking function of the drift sight is very jumpy. This erratic tracking appears to be caused by slop in the gearing and seems to follow about a four second period. In other words, if the tracking knob is set correctly, the drift sight will track the ground for about four seconds and then lose track for about a second and let the terrain pass under and then start and pick up tracking again for about four

more seconds and repeat.

(4) An old problem with the drift sight, which has never been corrected, are the fairly blunt corners on the prisms, which cause lines and yellow and blue shadows to appear on the drift sight presentation. These were noticed in early drift sight operations but were assumed to disappear at altitude because of the infinite focus required by the pilot to see the ground. But the opposite is true. These lines and shadows become more aggravated at altitude because the pilot's pupil becomes smaller due to the high intensity of light and thus any one of these lines or shadows will fill up his whole pupil and confuse the ground view much more readily than is apparent when testing the drift sight in a darkened room.

As a result of the above, the following steps must be taken to make the drift sight operational:

(1) A means of obtaining accurate drift measurement must be incorporated. To do this, a piece of plexiglass with vertical lines inscribed on it will be installed in the drift sight head. This plexiglass will be rotatable by the pilot so that he can line up the lines with the terrain moving underneath him. There

would be markings so that when he has it lined up, he can read his true, accurate drift. This is done with the drift sight locked in the vertical detent. This will permit a true and accurate drift reading to be obtained which is then set into the drift knob by the pilot. Thereafter, he has only to work the tracking knob in order to stop the ground presentation since the known drift has been accurately set into the control. This drift can also be rechecked at any time that the drift sight control handle is again in the vertical detent. We are making sets of these plexiglass drift cards and associated retainers for use at the ranch on flight test and detachment B airplanes.

(2) The prisms, which are causing the lines and shadows in the presentation must be replaced with prisms with sharp corners and any other optical fixes to correct this situation must be incorporated. It is obvious that it is possible to practically eliminate this condition because a few of the drift sights are not as aggravating as others.

(3) One of the reasons that the tracking mode is jumpy is because of the friction in the flexible control cables and their end attach-

ments. The end attachment problem is such that it depends on the individual mechanic as to how tight he makes the connection between the gearing and the flexible cable. This must be corrected by making the collars on these ends such that they will bottom out before tightening up on the flexible cable to gearing connection.

There are probably other items which can be corrected on these units of which we are not aware but the above three items must be incorporated immediately by Perkin-Elmer through the kit system or by factory overhaul.

A flight test program with the drift cards in place will continue to be conducted by Lockheed and the training people. This should result in three or four flights a week in which we will have data to check. This data will be used to determine the operational suitability of the drift sight for use as a navigational device and for the future use with the C equipment. In conjunction with this flight test program, an intensive pilot training and maintenance program with regard to correct drift sight operations must be conducted by the drift sight manufacturer. This means that Perkin-Elmer personnel, qualified to make engineering and operational decisions, must be constantly available at the Ranch until all their problems are licked. Whenever such people have appeared at the Ranch, they are kept constantly busy but they are always forced to leave before tying up the loose ends.

The above program should result in operational drift

sights. If sufficient improvement cannot be made to make the sight operational, then it must be regarded simply as a 45 lb. viewer, whose future compatibility with C equipment is questionable.

As a further sidelight on this operation, it is noted that the drift sight is being redesigned for the follow-on articles. The basic redesign involved here is the use of a 400 cycle servo-system in place of the mechanical gearing and flexible cable drive now used. It should be noted that the only problem of the above that this will solve is that one involving the sporadic tracking function. There will still be the same difficulties encountered by the pilots in trying to set in both drift and track with the knobs as he is expected to do at present. No matter how smooth the tracking function is made, the pilots will still have to go through an iterative process of setting the track knob, then the drift knob, and then the track knob, and then the drift knob, etc., constantly minimizing his error until it is eliminated. The drift card described above will still be necessary with the servo driven system.

We would like comments and schedules from you on the above items, which will tell us how and when you are going to have all of the drift sights in operational condition.

Best regards,

Copies of this program have been forwarded to Headquarters and [redacted] STAT